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A SUCCESSFUL POULTRY AND DAIRY FARM.

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., February 27, 1909.

SIR: I have the honor to transmit herewith, and to recommend for publication as a Farmers' Bulletin, a manuscript entitled "A Successful Poultry and Dairy Farm." This manuscript was prepared by Prof. W. J. Spillman, Agriculturist in Charge of the Office of Farm Management of this Bureau, who for several years past has made a careful study of the system and methods in vogue on this farm.

The farm described in this manuscript is of peculiar interest. It was hewn out of the timber by the owner and his family and farmed by them for eighteen years practically without outside help. It produces large crops; it is properly diversified in that it has two principal industries and one minor one; it is eminently adapted to the conditions of local environment; it is highly profitable; of the three boys and three girls raised on the farm those who have desired it have obtained a college education or are doing so. The owners of this farm are recognized as high authorities in agricultural matters by those who are acquainted with their work. They take a leading part in the farmers' institute work of the State in which they reside and are well known as contributors to agricultural papers. It is believed that this description of their methods and results will be of great value to all farmers in this country.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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A SUCCESSFUL POULTRY AND DAIRY FARM.

INTRODUCTION.

A strong tide is setting in from the city to the country. Not only is it becoming fashionable among wealthy people to own country homes, where they either farm or play at farming, but city wage-earners and substantial salaried employees are looking more and more to the farm as a relief from the grinding toil of the city and the uncertainty of salaried employment. The following letter is typical of many received by the Department of Agriculture:

I am an employee in a large manufacturing establishment. My wife, mother, and sister are dependent on my income, which is \$1,000 a year. I have saved \$2,000. I do not know what time some relative of a high official of the company may need my place. I desire to own a farm and live on it, so that I may feel the sense of proprietorship. I am offered 80 acres of land for \$2,000. I am thinking of offering \$1,000 cash and a like amount on time for this farm, so that I may have capital for starting in business. Do you think I can safely make the change?

The Bureau of Plant Industry is trying to get in a position to answer questions like this. Farming is a complex business. The successful farmer must be a good manager. This means that he must know what to do and how to do it, and must be able to do things at the time they should be done. He should have some knowledge of physics, mechanics, chemistry, physiology, and engineering. He must know something of the breeds of live stock and of the principles involved in feeding and breeding them. He must know something of soils, and most of this knowledge of the soil must come from experience with the particular soil he farms. No amount of knowledge of these things gleaned from books will completely take the place of experience. No man can begin farming without previous experience and be successful from the start. Yet some of the most successful farmers in this country began farming in middle life. Their success has been due to persistent effort, indomitable energy, patience, and a realization of their lack of knowledge which led them to seek information from every possible source. The first few years were full of discouragement. Later, many such men have won enviable reputations as farmers.

The present article is the story of a professional man whose longing for the freedom of country life led him at the age of 36 to abandon the city for the farm. Unfortunately the record of his early struggles is very incomplete. That these were severe is attested by the fact that the owner and his family, with a little hired labor, have cleared 76 acres of heavily timbered land, built a comfortable home, with substantial barn, dairy house, silo, and poultry houses, and have developed under trying conditions one of the best-paying farms in the country. In 1906 the gross income of this farm was about \$5,000; it is considerably larger now.

The farm referred to is that of Mr. H. L. Blanchard, of Jefferson County, Wash. It lies on the west side of Puget Sound, at the base of the Olympic Mountains. The products of the farm are butter, eggs, poultry, and a small quantity of fresh pork. These are carried to market 12 miles over a fairly good macadam road, by team, once a week. So careful is the owner of this farm of the market he has made that he has not once failed to deliver his products on his regular market day during the past twelve years.

Since this farm has been brought to its present profitable state by the joint efforts of every member of the household, it is proper to say that when the family moved to the farm in 1887 it consisted of man and wife, three boys, and three girls, the oldest child being a boy of 13. The only labor ever hired on this farm before the first son entered an agricultural college was a wood chopper for less than three months in 1886 to help do the first clearing, two carpenters for two weeks in building the house in 1887, and other assistants for miscellaneous pieces of work costing not over \$100 during the entire eighteen years up to the fall of 1905. The father and the three sons have done the farm work, milked the cows, and made the butter. The household duties have been systematically discharged by the mother and daughters, and for several years the mother and one of the daughters have run most of the poultry business, another daughter has reared the calves, while the third daughter has kept the books of the establishment.

HISTORY OF THE FARM AND ITS OWNER.

Mr. Blanchard was reared on a dairy farm in western New York. He was educated for the law and followed that profession for seven years. While practicing law he organized an iron company and spent the next seven years in connection with its business. This brought him again in contact with outdoor life, which he enjoyed and which gave him better health. The iron business did not prove satisfactory because of the excessive cost of the product, so that in 1886 he determined to buy a farm and devote his life to farming. Accordingly he

bought entirely on credit 80 acres of land, all heavily timbered, for which he contracted to pay \$33 an acre.

He began clearing the land at once (June, 1886). During the summer of 1886 and the following fall and winter, with the aid of his 12-year-old son and a hired chopper, who worked less than three months, he delivered 200,000 board feet of timber to a near-by sawmill. The sum received for this timber was sufficient to pay the chopper and to buy lumber for a home and barn. The house was built in 1887; as soon as it was ready the family moved to the farm. At this time the obligations of the family amounted to \$3,000.

The first important task after the family was established on the farm was the clearing of the land. Unfortunately, few who read this realize what clearing heavily timbered land in western Washington means. The owner estimates that had he hired all the labor for this it would have cost \$70 an acre for the bottom land and not less than \$150 an acre for the upland, including the removal of stumps.^a Twenty acres of the bottom land was so filled with fallen logs sunken in the soft muck soil that it could be used for pasture only for many years after clearing. Part of this 20 acres was put into cultivated crops for the first time in 1906.

Clearing went forward as time could be found for it. The first planting, consisting of 2 acres, was made in 1887. In 1888, 10 acres more were put in cultivation; in 1889 another 10 acres. In 1890, 15 additional acres were cleared sufficiently to be seeded to pasture grasses, and a like area was seeded for pasture the following year.

Much of this land was so wet as to require underdrainage, and the winter months were largely spent in putting in the necessary drains. These were made of cedar lumber obtained in the clearing operations.

In 1887 the owner of the new farm gave up his connection with the iron company. At that time the farm would not support the family. A good team and wagon enabled him to earn something by hauling timber and lumber for farmers who were clearing and building. He did such work for others as a means of supplying his family with the necessities and comforts of life. From the first he kept 1 or 2 cows, and in 1890 he had 6 or 7, descended from the old family cow and two others he had bought. The year before this he sold his first butter, put up in hand-made rolls and taken to market in a bucket. A piece of good fortune the second year made life comparatively easy the succeeding winter, for in the spring he planted 5 acres of potatoes, which made a good crop. As this was a famine year for potatoes, he was able to sell his entire crop at 2½ to 3 cents a pound. Potatoes were planted again the next year, but the price

^a Investigations now in progress by the Department of Agriculture show conclusively that these estimates are conservative.

was low and little profit was made. Finding a ready sale at fair prices for the small quantity of butter made the third year, he sold more the next year, and thereafter developed the dairy business as fast as conditions would permit. The neighboring farmers were astonished when he attempted to keep 7 cows on so small a farm; they said it could not be done. Nevertheless, in 1899 he had 36 cows in milk, raising all the roughage for these and for the necessary bulls, young stock, and work horses, besides some grain for the poultry. A cream separator was installed in 1891. The same year one of the daughters embarked in the poultry business. Three years later this business had grown to such proportions that the mother's assistance was necessary. At the present time (1908) the mother and daughter care for about 500 laying hens, while the head of the household has another flock of 200 for which he is individually responsible.

In the early days chickens, pigs, and cows were all kept in the same stable, the chickens being kept in a double deck over the pigsty. At the present time the equipment for managing poultry is hardly surpassed on any poultry farm in the country. As the older boys go off to college, the poultry business is gradually replacing the dairy, the work being lighter and the remuneration greater.

HOURS OF LABOR.

The hours of labor on the Blanchard farm are as follows:

5 to 7 a. m.—Feeding, milking, and separating the milk.

7 to 8 a. m.—Breakfast.

8 to 9.30 a. m.—Stable work, the cows being turned out to water while the stables are cleaned.

9.30 a. m. to 12 m.—General farm work.

12 m. to 1 p. m.—Dinner.

1 to 4 p. m.—General farm work.

4 to 6 p. m.—Chores, including milking.

Aside from the management of the poultry, the work of this farm is done by 3 men, including the owner, who in addition takes the entire care of 200 hens. At the present time the dairy herd consists of 33 cows. Since 1905 some hired labor has been employed, the wages paid being \$30 to \$40 a month with board and lodging.

The wages paid and the hours of labor may seem to compare unfavorably with those of corresponding occupations in the city; but is this really the case? It will be noticed that the working day is broken up into several periods during which different kinds of labor are done. The longest continuous period at the same employment is three hours. Although the total period of labor is eleven hours a day, it is so divided that the work does not become monotonous and is therefore not drudgery. Again, \$30 or \$40 a month, with excellent board and good lodging, is better wages than \$50 or \$60 a month in the city,

where board and lodging, usually of a very inferior kind, must be paid for out of the wages received. With such employment the laborer, if he is industrious and frugal, may lay by capital and ultimately become a proprietor himself. Few city employees, even those holding the more desirable clerkships in the leading stores, can save as much as they could as laborers on the better class of farms, nor can they live as well.

DRAINAGE.

As previously stated, a considerable portion of this farm consists of low-lying, more or less peaty soil. A fair-sized stream runs through this and gives some trouble by overflowing occasionally during the winter—the period of the year when most of the rain falls in all sections west of the Rocky Mountains. Perhaps 50 acres of the land on this farm require drainage. The stream bed is only slightly depressed below the general level of this 50 acres, so that drainage is more or less of a problem.

In the soft, peaty soil the drains are put in at distances ranging from 30 feet in the wettest places to 80 feet in the drier parts. The depth of the drains varies from $2\frac{1}{2}$ to $3\frac{1}{2}$ feet, according to the fall obtainable, the greater depth being preferable, because the settling of the loose soil soon exposes shallow drains. Formerly the drains were made as follows: A ditch was dug 2 feet wide and as deep as the fall would permit. Then two cedar timbers 5 inches square were placed at the sides in the bottom. These were covered by 2-inch cedar planks, 2 feet long, laid crosswise, and the ditch was then filled up with earth. As long as timber was abundant this method was satisfactory. Much of the excavating could be done by means of a plow, and the value of the labor expended in putting in these drains was estimated at 60 cents to \$1 a rod. Now that lumber for the underdraining must be bought, the plans for the work are to be changed. Earthen tile would soon become displaced in this soft earth, so that drains are to be made of 1 by 6 inch cedar boards, nailed together so as to make a long, square box. Two extra short boards are nailed on the ends of each box, so as to project 6 inches. When two of these boxes are placed end to end the short pieces nailed on the outside hold the ends in place. The ditches are dug only wide enough to receive the boxes.

THE CROPPING SYSTEM.

Of the total area of 80 acres, 4 acres of gravelly upland remain uncleared. Of the 76 acres from which the timber has been removed, only about 66 are in the farm proper, the remainder being taken up by roads, a stream, barn lots, chicken runs, a garden, an

orchard, the dooryard, and a piece of hilly, gravelly soil not fit for cultivation. Of the 66 acres 40 are plowed land.

The owner, like many of our best dairy farmers, does not attempt to follow a definite rotation over the whole of his cultivated land. Such a rotation will not produce what is needed in the proportion desired. On part of his land he usually adheres more or less closely to the following rotation, which moves about the farm as convenience demands:

Four acres of potatoes and roots.

Four acres of wheat with clover.

Then clover for two or three years.

Before a silo was built 4 acres of roots, usually mangel-wurzels and turnips, were nearly always grown. With silage so many roots are not needed, though some of them are always grown to give variety to the ration. The above rotation occupies about half the cultivated area and is not confined to any particular fields. The root crops are put in on any grass land which may need to be reseeded, just as is the case with corn on small, well-managed New England farms.

On the more moist land English rye-grass is sown with clover. The rye-grass seed is scattered broadcast on the newly sown wheat land in the fall and is covered with a weeder. The clover seed is sown in the spring just after a freeze, late in February or early in March. On the drier land orchard grass is used instead of rye-grass. Rye-grass is not grown to any extent in the United States except in western Washington. On moist land in that section it is a fine hay, pasture, or silage crop. It is practically an annual, but if properly managed it will reseed itself and make almost a permanent meadow on suitable soil. It thus reseeds itself on much of this farm.

The wheat in the rotation mentioned, as well as that grown elsewhere not in any regular rotation, is used partly for soiling, but is mainly grown for chicken feed. Wheat on the peculiar soils of these mountain valleys west of Puget Sound probably produces larger yields of grain than anywhere else in the world. Eighty-four bushels to the acre have been grown on this farm, and anything less than 60 bushels is considered a poor crop. Such crops could not, of course, be grown except on farms that have an abundance of manure. Singularly enough, none of the wheat grown in this (Jefferson) county can be used for bread making, because it is entirely too starchy. It is grown mainly for use as feed for poultry, but is also fed to live stock.

The remainder of the 40 acres of cultivated land is devoted to miscellaneous crops not grown in any regular order. Such crops as rye, wheat, barley, oats, wheat and oats, peas and oats, vetch and

oats, etc., are grown for soiling, hay, or silage, as required. On some of the muck land not adapted to clover, turnips are usually sown about the first of July, to be followed by a mixture of redtop and rye-grass. This may be used for hay the next year, or it may be taken for pasture, a like area of other pasture land being plowed up. This muck land also gives good crops of wheat and oats. Wheat, barley, oats, etc., not in the regular rotation may or may not be followed by grass. Some barley for soiling is sown as late as August.

As already stated, a tract of about 20 acres of muck land was so full of sunken logs that it could not be plowed until these logs rotted. This piece of land was used for cow pasture for many years. By 1906 part of it could be plowed, and since then most of it has reached a condition that permits plowing. When any of it is plowed up, a like area of tillable land on the 40 acres previously mentioned is converted into pasture, so that there are always 20 acres of cow pasture. In addition, there are two pig and calf pastures of 2 acres each and a pasture of $1\frac{1}{2}$ acres near the barn for the horses.

THE SILO AND THE SILAGE CROPS.

The silo, which is made of 2 by 6 staves, is 16 feet in diameter and 24 feet high. It holds about 65 tons of uncut grass and clover. If a new silo were built it would be made at least 30 feet high. The silo is lined with cement, the lining being renewed as occasion requires. No corn is grown, as this crop does not do well under the prevailing conditions. Peas and oats were formerly used largely for silage, but for the past few years peas have failed for some reason. Experiments with vetch as a substitute for peas have been made, and it has been found very satisfactory. One year when the peas were destroyed by worms the vetch was not touched.

Since peas began to fail, clover and English rye-grass have been the main dependence for silage. Rye-grass is a welcome addition to the clover, for the cows relish it greatly and it adds much to the yield. On the higher, drier fields orchard grass is sown with clover, to be used either for hay or silage. In 1907 the silo was filled with barley, on account of the failure of the peas in a crop of peas and oats, the barley being sown on August 10 and cut about October 15. The owner was led to use barley by the experience of another farmer who makes silage of barley without a silo, the green material simply being stacked and covered with 18 inches of earth.

When clover and rye-grass are used for silage the crop is cut about June 16 to 20, finishing by the time clover is in full bloom. Peas and oats are cut for silage when the oats are just entering the dough stage and the first peas are ready for table use. Cut at this stage

the silage is sweeter than if cut earlier. If cut much earlier it is liable to develop a very unpleasant odor.

The materials used for silage on this farm have taught the value of thorough trampling in filling the silo, and the owner is of the opinion that improper filling accounts for much poor silage. Rye-grass is very heavy and packs well, but not so well as corn. In filling, two men are kept in the silo. The green material is spread evenly and trampled thoroughly next the wall. Trampling is unnecessary in the middle, where the green material falls. Unlike corn, the material is put in uncut, being elevated with an ordinary hayfork. Trampling around the walls is kept up at intervals as long as the silage continues to settle, say for ten to fourteen days after filling, depending upon the rapidity of filling. Rapid filling means long settling. The silo is filled to the top, then two or three loads a day are added for several days, as the material settles. The filling continues as long as the settling will permit the addition of a full load every other day, and when completed the silage is at once covered at least a foot deep with green marsh grass, well trampled and well wetted. The wetting is repeated daily for two or three days, and the trampling continues several days longer. For the wetting, water is drawn up in buckets from barrels in a wagon. Two barrels are sufficient for one wetting. It is easily seen that the men on this farm are more afraid of spoiled silage than they are of work.

THE HANDLING OF MANURE.

It goes without saying that on a farm as well managed as this good use is made of all the manure produced. It is hardly practicable under the conditions to haul the manure to the field every day, which is really the best practice where it can be done. The manure is removed from the barn daily, and every two weeks a general cleaning up occurs, all the manure available on the place being taken to the fields. It is spread on newly plowed land and on grass lands. Heavy applications are made on the garden and on land which is to be devoted to root crops. Every part of the farm receives manure in its turn.

THE DAIRY HERD AND ITS MANAGEMENT.

Like many a beginner, the owner of this farm started in with cows that did not belong to a dairy breed. These cows were Shorthorns. Some of the original stock were good milkers, but when a pure-bred Shorthorn bull was bought for \$125 the heifer calves proved worthless in the dairy. This excellent beef bull had tuberculosis, and the owner got rid of him and all his get with comparatively little loss of

time. About this time a dairy near by "broke up," and 6 really good Jersey cows were taken for their keep. After keeping them five years, 3 of them were purchased, as was also a registered Jersey bull, the first registered animal ever brought into the county. At that time the herd consisted of 16 to 18 cows. When the produce from this bull came to maturity the owner found he was on the right line, and his herd consists now of high-grade Jerseys and Guernseys.

In 1892 contagious abortion, the bane of dairy farming, broke out in this herd. Eighteen out of 19 cows aborted. In 1893 only 2 or 3 calves were born. About half the herd aborted in 1894. This incident well illustrates the reason why this farmer has been so successful. Most men would have given up dairying at this point. Not so with him. He wrote to the State veterinarian and learned how to treat the disease and then went to work and cured his cows.^a Before the season of 1894 was over he had the disease completely mastered and has had no recurrence of it since. The loss of calves in 1892 and 1893, however, was a serious blow, from which it took several years to recover. The disease was introduced into the herd by loaning the bull to a neighboring dairyman whose herd was infected, a fact not known at the time.

The data for this bulletin have been obtained on three separate visits to Mr. Blanchard's farm—in 1905, 1906, and 1907. The following description of the dairy herd relates to the year 1905, when the herd was about at its maximum. The second son had just gone away to college, the oldest son having already graduated in agriculture and entered the service of the United States Department of Agriculture. Since that time the herd has been allowed to decrease in size, a corresponding increase in poultry compensating therefor. At that time there were 37 cows in the herd. From 9 to 12 heifer calves were saved each year, so that there were usually on hand about this number of yearling heifers and a like number of calves. Male calves were made away with as soon as born, as is the practice on most good dairy farms having grade cows. Not all the heifers were needed to keep up the herd, so a good many of them were sold. Experience has shown that after a herd is once built up it may be kept at a high degree of efficiency by using well-bred bulls and saving one-fourth as many female calves every year as there are cows in the herd. This means keeping half as many young females (calves and yearlings together) as there are cows. This enables the dairyman to replace not only the old cows that are beginning to fail, but also young cows that have not proved profitable.

^a Information regarding this treatment may be obtained from the various State agricultural colleges and from the U. S. Department of Agriculture.

Two bulls are kept, one younger than the other, so there is a chance to determine the value of a new one before an old one goes.

The owner endeavors to have most of his cows freshen in the fall, because of the higher price of butter in winter. It is not possible, however, to get all the cows fresh at this season. Usually about half of them bring calves in September and October, one-fourth during the winter, and one-fourth in the spring. This gives, under his conditions, a fairly satisfactory distribution of the product throughout the year. If all the product were sold to private customers it would be preferable to have the same flow of milk at all seasons, but the method of marketing, described later, makes it more profitable to have the largest flow of milk in winter. The smallest number of cows, 15 to 20, are in milk during August. During May and June, 32 to 33 are giving milk. Cows that freshen in the fall bring the largest annual income, other things being equal, since they give most of their milk during the season of high prices.

This herd contains no phenomenal milkers. A few of the best cows give more than 400 pounds of butter a year, yet the average yield of butter for 1905 was only 256 pounds for all cows, including dry ones. At least one-fourth of these cows were heifers with their first calves. The writer is inclined to attribute this moderate yield to the owner's system of feeding. He has never fed much grain, not over half as much as some dairymen feed. He has never thought it profitable to feed concentrates heavily. Considering the fact that butter is sold at market prices and that concentrates are relatively high priced, the system followed is probably correct in the main. Suppose 1,000 pounds more grain a year were fed to each cow and the butter yield thereby raised to 300 pounds; this grain, at \$20 a ton, would be worth \$10; the difference between 300 pounds of butter and 256 pounds is 44 pounds, which, at 26 cents, amounts to \$11.44, or only \$1.44 more than the value of the additional concentrates. These figures are only estimates. The actual results might possibly throw the balance on the other side. It is probable that this herd could easily be made to average 300 pounds of butter per cow if it were profitable to do so. If the owner were situated near a large city where he could sell all his butter or a large part of it at fancy prices (it is fancy in quality), he would be justified in feeding more heavily than he does.

There has never been a case of milk fever on this farm. The owner does not know whether this is due to his system of feeding or to the absence of phenomenal milkers. It is probably due to the latter, and that in turn to the system of feeding.

SYSTEM OF FEEDING DAIRY COWS.**Winter Feeding.**

In winter dry cows are fed 10 to 15 pounds of roots (turnips or mangel-wurzels) daily and all the hay they will eat. The hay usually consists of peas and oats or rye-grass and clover, both excellent for cattle. As freshening time approaches the quantity of roots is gradually increased to twice the above amount, and bran is added. Under such conditions mature cows receive 4 pounds of bran a day by the time they freshen, heifers half this quantity and half as many roots. All cows are kept in the stable in winter, except for a short period each day when they are let out to drink while the stable is cleaned.

Cows giving milk during the winter are fed all the hay they will eat, which is about 12 to 15 pounds a day, besides 20 to 30 pounds of silage, 20 to 40 pounds of roots, and 4 to 8 pounds of bran and shorts daily. Bran costs \$19 to \$20 and shorts \$20 to \$22 a ton. They are mixed half and half by weight.

Summer Feeding.

Silage and roots are grown in quantities sufficient to last till soiling crops and pasture are ready in the spring. An acre of rye is sown in the fall for early soiling. This is followed by wheat. Soiling crops in summer take the place of silage in winter, and pasture takes the place of roots. While feeding green rye the bran and shorts are continued as in winter feeding, but as soon as wheat comes in for green feed the feeding of concentrates ceases entirely. Hay is fed the year round—all that the cows will eat. In winter, with roots, silage, and concentrates (bran and shorts), the cows eat 12 to 15 pounds of hay a day. In summer, with an abundance of green feed, they consume about 5 pounds of hay a day. Dry cows simply run on pasture in summer, receiving no other feed.

Soiling Crops.

When it is convenient in the cropping system, an acre of rye is sown in the fall for use as green feed in early spring. It is sown in October, and is fed about May 1 to 15. At the beginning of this period the rye has not yet headed out; at the end it is in the milk stage. Pasturing begins about the same time as soiling. The aim is to begin pasturing when the supply of roots is exhausted, and soiling when silage gives out. The feeding of bran and shorts ceases when the change is made from rye to wheat for soiling. One reason

for this is that wheat is more palatable than rye, and the cows eat more of it. Another is that by this time the pasture is in excellent condition.

Wheat, which succeeds rye in the soiling system, is sown by the middle of October, sometimes as early as October 1. It is fed from May 15 to June 1, during which time about 1 acre of wheat is used. Clover may take the place of wheat in the soiling system. Both wheat and rye for soiling are sown very thick on the best land, 3 or 4 bushels of seed to the acre. This is low, moist land, which requires a higher rate of seeding for all the cereals than does drier land.

Usually by June 1 the pasture has become so productive that soiling may be dispensed with until the middle of July. During this month and a half the cows ordinarily receive no feed except pasture and what hay they will eat (about 5 pounds a day under these conditions). About the middle of July soiling begins again, on peas and oats or second-growth clover. These are cut from the regular hay fields and are fed for two or three weeks. After this specially sown fields of mixed grains, wheat, oats and peas, etc., are used for soiling until about October 1. Beginning June 1, an acre of these mixtures is sown about every ten days, the last sowing about July 4. The field sown June 1 is fed during the first ten days of August. Four sowings of mixed grains with occasional short periods of pasture on fields where crops have been cut (but never on the clover sod) suffice until about October 1. Beginning the middle of July, an acre of barley (White Hull-less, a beardless variety) is sown about every ten days or two weeks, the last sowing being made about the middle of August. Usually two or three sowings of barley are made. This crop is ready for soiling about October 1 and is available until nearly the middle of November, when the winter system of feeding begins. Barley sown late in the season in this manner comes on rapidly at first, but its later stages are retarded by cool weather in the fall, so that it remains in condition suitable for soiling longer than crops sown earlier in the season. Less soiling is also required in the fall, as a good many fields from which soiling crops have been harvested are available for pasture at this season, in addition to 20 acres of very rich permanent pasture. Barley is regarded as a fine soiling crop.

Gaps in this soiling system are filled by pasturing fields from which the crops have been harvested. The hay fields in the rotation are never pastured. Any surplus of a soiling crop is made into hay or silage.

As this soiling system is of special interest, it is given in tabulated form below.

Soiling system for dairy cows in use on the Blanchard farm.

Crop.	When sown.	When used.	Number of days used.
Rye.....	October.....	May 1 to 15.....	15
Wheat (or clover).....	October 1 to 15.....	May 16 to 31.....	16
Pasture.....	June 1 to July 15.....	45
Peas and oats (or second-growth clover).....	Spring.....	July 16 to July 30 or August 6..	14 to 21
Mixed grains.....	June 1.....	August and September, with periods of pasture.	61
Do.....	June 12.....		
Do.....	June 24.....		
Do.....	July 4.....		
Barley.....	July 15.....	October and first half of November.	45
Do.....	July 25.....		
Do.....	Aug. 13.....		

MANNER OF HARVESTING CERTAIN CROPS.

For cutting soiling crops, silage, and grain hay Mr. Blanchard uses a side-delivery reaper that leaves the cut stuff in bunches very convenient for handling with a hand fork. In cloudy weather, soiling material is cut twice a week; in sunny weather, three times. It is immediately loaded upon a wagon and drawn to the barn where it is to be fed, and it remains on the wagon until used.

In curing grain hay cut in this manner, a few hours after it is cut four bunches are put together in a small cock. The next day these are made into larger cocks, which remain in the field until the hay is cured.

DAILY ROUTINE FOR COWS IN SUMMER.

A small feed of hay is given early in the morning. About 8 o'clock the cows are turned out to pasture. At noon they are stabled and given a feed of green forage. Another such feed is given at 3.30 p. m., and still another at 6 p. m., after which they are turned out to pasture for the night. The quantity given at each of these feeding periods is governed by the amount the cows will clean up. In feeding soiling crops it is important not to put too much feed before cows at a time. After they have mouthed over the green stuff for a while they refuse to eat it and call for fresh material. They should be given only what they will eat before they have fouled it too much to relish it.

When the hay is of the best quality, no grain is fed during the soiling period (except when rye is fed) even to fresh cows, but if the hay is not the best a small quantity of grain is fed fresh cows at the morning feed.

FRESHENING AND DRYING COWS.

Three weeks before a cow freshens, if this occurs during the winter feeding period, Mr. Blanchard begins feeding about 2 pounds of bran a day. No shorts are fed until after calving. This feed is gradually

increased until at calving time the cow is receiving about 4 pounds of bran daily. After freshening, the cow's grain ration is gradually increased by adding shorts until the amount fed reaches a maximum of 8 pounds for the best cows in the herd. In the case of the smallest milkers, shorts are gradually substituted for half the bran after the cow freshens, so that these cows get only 4 pounds of bran and shorts as a maximum grain feed. The average cow in the herd gets about 6 pounds of bran and shorts when in full flow of milk in the winter.

An effort is made to have each cow dry from six to eight weeks a year. The cows are milked regularly twice a day up to within a week of the time they are to be turned dry. They are then milked once a day for three or four days, a small quantity of milk being left in the udder each time. After this they are turned out to pasture and are not milked again until the next period of lactation begins.

CARE OF THE BULLS.

The two bulls are kept together in a lot. They get a good deal of exercise by "scrapping" with each other. They are fed much the same as the cows. The reason for keeping two bulls, as already stated, is that it affords a chance to test the new one before an old bull of known merit is disposed of.

REARING THE CALVES.

The owner of this farm prefers to raise fall and winter calves for the dairy. It is more convenient under his conditions to give them the attention they need than in the case of those born at other seasons. The calves are allowed to nurse their dams only once. After this they are fed their mother's milk for two weeks. The first week they are given 2 quarts of milk in the morning, 1 quart at noon, and 2 quarts in the evening. The second week they are given 3 quarts twice a day, morning and evening. During the next two weeks the feed of the calf consists of half whole and half skim milk, with a pinch of flaxseed meal (made by grinding the whole seed) added to it, about 1 ounce at a feed. The quantity of milk fed during this period (the second two weeks) is about 3 quarts twice a day.

After the calf is a month old it is given 4 quarts of skim milk twice a day with an ounce of flaxseed meal and a handful of mixed corn meal and ground oats. The calf is taught to eat this by putting the mixture in the milk a few times. Then the grain is fed dry, after the skim milk. Feeding this dry material after the skim milk is finished prevents the calves from sucking each other when they are let out of the stanchions in which they are fed. The quantity of grain is gradually increased until at two months of age the calf is

receiving a quart of the mixture a day. About this time the feeding of a small quantity of roots and silage begins, and the calves are given all the hay they will eat. Milk is fed until the calves are six months old, sometimes longer. They have access to fresh water at all times.

The calves are fed in stanchions, as shown in figure 1. These stanchions are very convenient and are easily constructed.

In spring the calves are turned out to pasture in a small inclosure made for their use. As they begin to eat grass freely, they are fed less milk, grain, etc., though, as previously stated, milk is fed more or less until the calves are at least six months old. During the next fall and winter they are given rations similar to those of cows in milk, but smaller in proportion to their size.

The owner cautions against breeding heifers too soon. He says that heifers should not bring calves under twenty-five or twenty-six

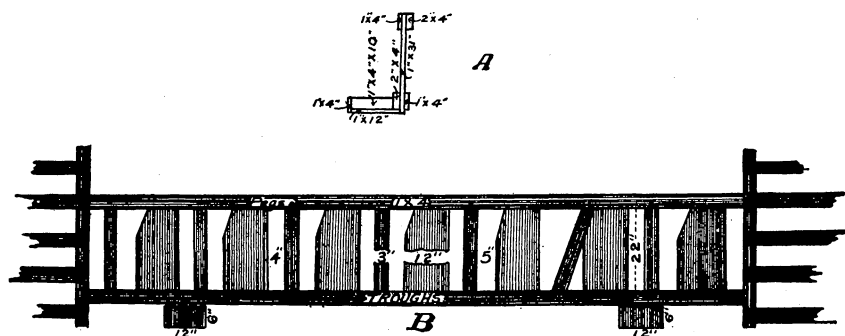


FIG. 1.—Calf stanchions. *A*, cross section showing dimensions and details of construction; *B*, front view. These stanchions form a section of a fence, as shown at ends. The 12 by 6 inch blocks under the troughs are supports for the structure. The long trough is divided by partitions into 15-inch and 9-inch compartments, alternating with each other. The 15-inch compartments are in front of stanchions and form the feeding boxes. The 9-inch spaces are not utilized.

months of age, and thirty months is better. Make winter cows of as many of them as possible; enough will go over till spring anyway to give needed cows at other seasons.

DISPOSING OF THE PRODUCTS OF THE DAIRY.

The only dairy product sold is butter. The skim milk is fed to pigs and poultry. In 1905, 3,120 pounds of butter were sold on contract to one merchant at 26 cents a pound the year round. The merchant has regular customers for this butter. An attractive exhibit recently made at a fair in the market town considerably increased the number of these customers. Another merchant who makes a special feature of the brand bought 5,460 pounds at creamery prices. The price received for this portion of the product was on the average about the same as for that delivered on contract.

About 400 pounds were sold to miscellaneous customers during the year. The total quantity sold during 1905 was 8,980 pounds, which at the average price of 26 cents brought \$2,334.80.

In addition to this the family used all the milk, cream, and butter wanted, probably the product of two cows. It is fair to assume, therefore, that 35 cows out of a total of 37 on hand during that year produced the 8,980 pounds of butter sold. This is at the rate of 256½ pounds per cow per year, as already stated.

HOGS.

Two or three good brood sows and one boar are kept on the farm. The owner butchers during the year 35 to 40 pigs, weighing from 150 to 160 pounds each, dressed weight. What meat is not required for home use is sold to butchers in the market town 12 miles away and brings 7 to 8 cents a pound. There is no difficulty in selling all the meat produced, and the same is true of all the products of this farm. The more there is to sell the easier it is to sell it. Butchering is done twice a year, in the fall and in the spring, when the pigs are six months old. The total income from this source is about \$400 a year.

MANAGEMENT OF PIGS.

The sows farrow twice a year, in March and October. They run on good grass pasture at all seasons. They share 5 acres of such pasture with the calves, horses, and pigs, though horses and pigs are not in the same inclosure at the same time. For about a month before farrowing time the sows, in addition to pasture, are fed roots—any kind on hand—and a little shorts in skim milk. The first two days after farrowing the sows are fed very lightly. After this the feed is increased until in a few days they are receiving 1 quart of shorts three times a day and all the skim milk they will eat. They are also given what roots they want until pasture becomes abundant. In the case of fall litters the feeding of roots continues until the pigs are weaned, which occurs when they are 6 weeks old. After weaning time the pigs are fed three times a day all the shorts, skim milk, and roots they will eat in addition to pasture, roots being omitted when pasture is very abundant. When the pigs are 5 months old coarse corn meal is substituted for shorts. They are then confined in pens, but are fed some green stuff daily.

When not suckling, the sows depend entirely on pasture, if it is sufficient to keep them properly. If not, they are fed enough shorts, skim milk, roots, etc., to keep them in good condition. As previously stated, heavier feeding begins about a month before farrowing time.

POULTRY.

During the past few years the poultry business has grown to equal the dairy as a source of income on this farm, and now actually exceeds it. Common hens of no particular breed were used at first. Within a year or two the business grew to such proportions that Mrs. Blanchard began to employ much of her time in connection with it. At the present time the mother and daughter care for 500 hens and their product, while the father looks after an additional 200. Poultry has paid from the beginning. As the boys go away to college, the poultry business is gradually replacing the dairy, as the work is lighter and the remuneration greater, especially since a good market has been obtained for eggs for hatching purposes.

On this farm it has been learned that well-bred fowls pay better than those of no particular breeding. It has also been learned that fine feathers and egg laying do not always go together. The hens on this farm have been bred for egg production, and last year a pen of 30 hens laid an average of 186 eggs each. There are probably few flocks of hens in this country that lay more eggs on an average than those on this farm. Some of the best hens are believed to lay 250 eggs a year, or very nearly that number. Trap nests are not used, but all who look after the poultry are excellent judges of egg-laying qualities as indicated by form and other characteristics. Good layers only are selected for the breeding pens.

The breeding of pure-bred fowls was begun with the Barred Plymouth Rocks, and this breed is still the leading one on the farm. As a market was built up for eggs for hatching, customers began to call for eggs of other breeds. The most frequent calls, after Barred Plymouth Rocks, being for Brown Leghorns, that breed was next introduced. Others were selected as the market demand for eggs indicated, so that now, in addition to Barred Plymouth Rocks and Brown Leghorns, flocks of White Plymouth Rocks, Black Minorcas, and White Wyandottes are maintained.

POULTRY HOUSES.

While the poultry houses on this farm are not expensive, they are eminently practical and have been designed with a view to convenience in management, comfort and cleanliness of the fowls, and protection against enemies of all kinds. There are no losses from weasels or other small animals, for these pests of the poultryman are completely fenced out of the laying, breeding, and brooder houses. The houses for the laying pens cost about \$1 per hen. In one of the groups they are so well planned and answer their purposes so perfectly that they are here described in detail.

The two perches are on a level with each other, so that there will be no crowding on the top perch. They are placed 15 inches above the dropping board. Figure 6 shows how the perches are supported. They do not touch the walls of the room at any point. This is important, as it aids in keeping down vermin. The self-feeders are mentioned later.

As shown in figures 6 and 7, the perches and nest boxes are supported entirely by suspension from the rafters. The supporting frame does not touch the walls at any point. The hens enter the nests from the rear, where

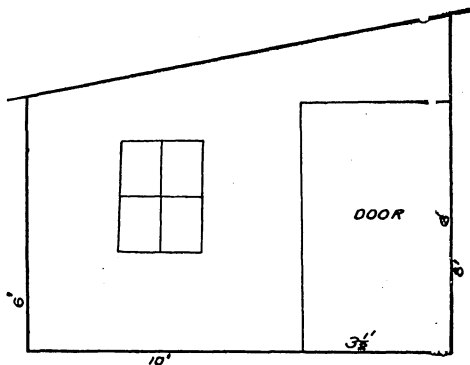


FIG. 3.—End view of feed room in poultry house.

the nest boxes are boarded up only half way. The board on which the boxes rest extends 6 inches beyond the boxes at the rear to form a platform on which the hens alight when they fly up to the nests. The bottom of the nest boxes is 2 feet from the ground.

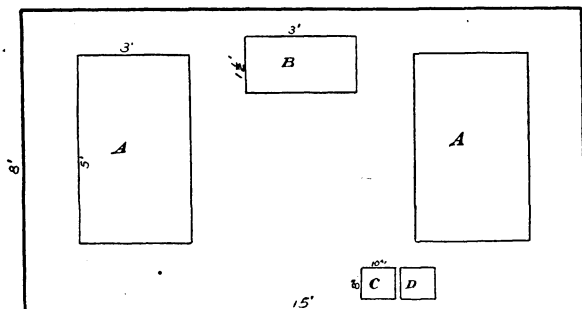


FIG. 4.—Front view of a single compartment of the poultry house. *A, A*, Doors 5 by 3 feet, each having two shutters, one opening inward, covered with No. 10 muslin, and the other opening outward, covered with chicken wire; *B*, ventilator $1\frac{1}{2}$ by 3 feet, with muslin-covered shutter hinged at top and opening inward so it can be propped open; *C*, opening 8 by 10 inches between pen and yard for passage of hens; *D*, sliding cover for *C*.

The dimensions of the various parts of the supporting frame are shown in figure 7.

These houses are not artificially heated at any season of the year. On the coldest nights during the winter the openings (doors, windows, and passageway for hens) are all closed, the ven-

tilation being entirely through the muslin doors (fig. 4, *A*) and the muslin-covered ventilator (fig. 4, *B*). In cold weather the fowls must not be exposed to drafts.

VERMIN.

Vermin (mites) are the bane of improperly managed houses. They conceal themselves on the undersurface of the perch, in the corners of nest boxes, under the dropping board, and in crevices wherever convenient to the roosting places of the fowls. In these

places of concealment the vermin deposit their eggs. Once every year every possible hiding place for vermin is painted with a coal-tar preparation. This is applied full strength with a brush. The

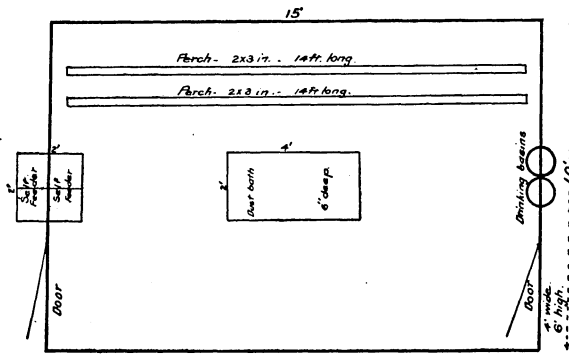


FIG. 5.—Ground plan of a compartment of poultry house.

whole inside of the nest boxes is thus painted. This treatment keeps the vermin in subjection.

The dirt floors of the pens are usually covered several inches deep with straw, which is changed about every ten days. In summer the floors are

swept clean about once a month; in winter, less often—usually twice during the season.

The interior of these houses is whitewashed once a year, a pint of disinfectant being added to each bucket of whitewash. This aids in keeping down vermin. The fact that the perches and nest boxes are swung from the rafters and nowhere touch the walls prevents mites from hiding in crevices in the walls.

The owner estimates that with houses constructed as these are one man could take care of 1,500 to 2,000 hens. In 1905 he had about 500 laying hens, but the

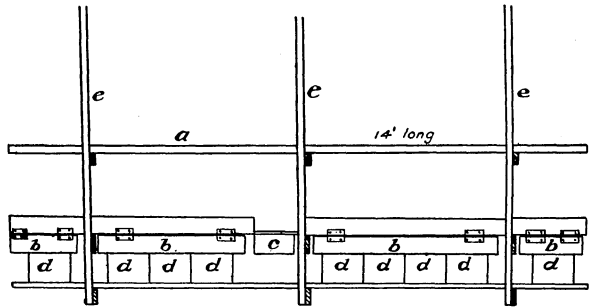


FIG. 6.—Front view of perches, nest boxes, etc.: a, Perch 14 feet long, 15 inches above platform, and about 20 inches below rafters, and not touching wall at either end; b, hinged shutter to cover front end of nest boxes; c, sloping board to facilitate raking out droppings from platform; d, d, d, nest boxes, 12 inches wide, 8 inches high, and 10 inches from front to back, boarded up half way in rear; e, e, supports attached to rafters.

number has increased since then. At that time he hatched 1,000 young a season. Half of these would of course be males. From the remaining half he was able to secure enough good pullets to replace discarded hens. Only pullets are used in the laying pens. The best of these are retained for the breeding pens the next year. Occasionally a hen of exceptional merit is kept in the breeding pen during her third year. A few of the best pullets, especially those that begin laying very early, are put in the breeding pens the first year.

The houses here described are for laying hens only. The breeding pens are similarly constructed, but are not so large, since fewer hens are kept together (see p. 38).

INCUBATION.

For the first nine years only hens were used for hatching. The Barred Plymouth Rocks were used mostly for this purpose, as this breed is more inclined to broodiness than the Leghorns. The tenth year incubators were installed and were successful from the start. They are now used exclusively except when it is desired to keep a few specially selected eggs separate or to start eggs to refill the incubators when infertile eggs are tested out.

Eggs are always gathered in the evening after feeding time. Those from the breeding pens are placed in a basket having separate compartments for each pen. A record book is kept in this basket and as the eggs are gathered the number obtained from each pen is recorded. Eggs intended for hatching are placed in egg cases in a room having a temperature of about 55° F., and the cases are turned every day so there will be no tendency for the yolk to settle to one side of the egg. Other eggs are kept in a cooler room.

The incubator room is built entirely above ground, though

it is recognized that a cellar or half cellar would be preferable in a section where sudden changes of temperature are likely to occur. In the vicinity of Puget Sound the climate is quite equable, so that the above-ground structure answers very well. This building, however, is ceiled inside to protect against sudden changes of temperature.

The incubators are started about January 15 to 20. Two days before the eggs are put in, the machines are thoroughly cleaned and aired and the lamps filled and lighted. This is necessary to get the incubators heated and regulated. The temperature is adjusted to 102½° F. Enough incubators are kept to hold 500 eggs, and usually four hatchings are made, requiring a total of about 2,000 eggs. The first two hatches are usually from the heavier breeds, the later ones from the smaller breeds, for the reason that the large fowls develop

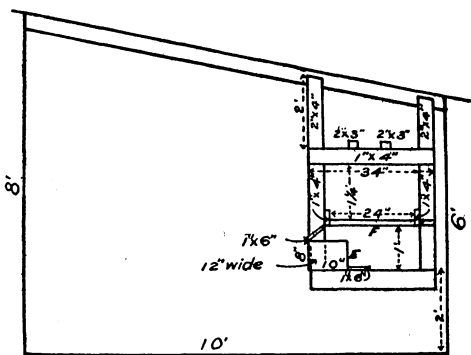


FIG. 7.—Cross section of poultry pen, showing method of supporting nests and perches.

more slowly and by hatching them earlier the pullets come to maturity more nearly at the same time with Leghorns and other small breeds.

During the first two days in the incubator the eggs are left undisturbed; after that they are turned over twice a day. On the sixth day the eggs are candled, and those in which there is no sign of a developing embryo are removed. Eggs thus removed are boiled hard and used later as chicken feed, as described farther on. When the incubators are started, either a few hens are set or a small incubator is filled, and these eggs are used in replacing those tested out from the large incubators. This is an economy well worth while if facilities are at hand for it, as it runs the large incubators at their full capacity. It costs no more to hatch 300 eggs in a 300-egg incubator than it does to hatch 200 in the same incubator.

On the nineteenth day the eggs are candled again, and all that do not show well-developed chicks are removed.^a Hatching begins on the twentieth day. At the end of the twenty-first day the egg trays and all shells and other litter are removed. The chicks are left in the incubators twenty-four hours longer, during which time the temperature is gradually lowered to about 95° F. They are then removed to the brooders and receive their first feed and drink.

PERCENTAGE OF HATCH.

From 65 to 75 chicks from 100 eggs is regarded as a good hatch, and 80 as extra good from eggs of which 90 to 95 per cent are fertile. A number of chicks die by the time the point of the bill breaks through the shell. They do not seem able to extend the rupture in the shell beyond this point. Some poultrymen attribute this to inherent weakness in the chick, while others think it is because the chick fills the shell so completely that it is unable to move sufficiently to extend the break. It may sometimes be due to shells that are too strong for the chicks. We see here a case where natural selection bears a heavy hand on the unfortunate individual which varies in such a way as to be unable to pass this narrow portal in the life of the chick.

THE BROODERS.

Not less than a week before the first hatch is off, the brooders are thoroughly cleaned and then disinfected by painting all the wood-work with a disinfectant. When the chicks first begin to hatch, two days before they are removed to the brooders, the brooder lamps are lighted and so regulated that the temperature is about 95° F. Sand thoroughly dried in an oven is spread while yet warm about an inch deep on the floor of the brooder, and this is covered half an inch

^a This is contrary to the rule generally followed, which forbids the touching of eggs in an incubator after the eighteenth day.

deep with fine chaff secured from the mangers, barn floor, etc. On this, under the hoverer, the brooder thermometer is placed. When this stands steadily at 95° F. the brooder is ready for the chicks.

In removing chicks from incubator to brooder great care is used not to allow them to become chilled. They are moved during the warmest part of the day in a basket lined with a warm blanket, part of which is folded over them. This care is made necessary by the fact that the incubators and brooders are in different buildings.

As soon as the chicks are placed in the brooders, food and water are given them. For the first three days they are confined to the brooders, and are fed three times a day. Only 50 are placed in brooders having a rated capacity of 100, experience having shown that better results are secured thereby. At the end of the third day the gate is opened to permit the chicks to enter the runway. The brooders are so placed that their runways have direct sunlight through the windows of the brooder house, as sunlight is regarded as an important agency in keeping the flock healthy. The floors of these runways are covered about 2 inches deep with chaff.

During the first week the temperature of the brooder is gradually reduced until at the end of the week it is 90° F. Thereafter the temperature is lowered at the rate of 5 degrees a week till it reaches 65° to 70° F., at which it remains as long as the chicks stay in the brooder house. In order to make room for another hatch the chicks, by the time they are 4 or 5 weeks old, are sometimes transferred to an adjoining brooder room, where the temperature is not so high.

Just outside the brooder house are a number of small yards, or runways, one for each brooder. After the chicks are about 6 days old, if the weather is favorable, they are allowed the freedom of these outside yards, which are kept clean and are frequently spaded up. The young birds enjoy scratching and dusting themselves in the loose dirt. They spend the nights under the hoverers of the brooders until they attain the age of 5 to 8 weeks, the length of this period depending on the weather and on the date of hatching. Early hatched birds stay in longest. Six weeks is about the average length of the brooder stage.

If the chickens remain outside the hoverers after their usual roosting time in the evening it is probably too warm under the hoverers. In this case the temperature should be lowered. If they are inclined to huddle together at times when they should not be at roost they are probably too cold. Too much heat is considered more detrimental than not enough. In cold, bad weather the brooders are covered with blankets to insure proper temperature.

At the end of the brooder period the chicks are removed to an ordinary roosting house on the range.

FEEDING THE YOUNG CHICKENS.

For the first 6 days a commercial chick feed is used, consisting of cracked grains, such as wheat, oats, corn, millet seed, weed seed, charcoal, grit, egg shells, meat scraps, etc. There is some difficulty in getting this material properly made; in some cases it has contained ten times as much rock for grit as is needed. Part of this food is placed in shallow saucers and the remainder scattered among the chaff. The chicks are fed three times a day at this period. When they have learned to scratch for their food, which they will do in one or two days, the saucers are removed and all the food is thrown among the chaff. It is important that the young birds should be active, so scratching for this food is good exercise. Clean water is kept before them at all times.

When the chicks are let into the outdoor runs, which is about the sixth day if the weather is suitable, skim milk is added to the ration. This is fed once a day, in the morning, and is placed in drinking fountains in the outside runways. The quantity of milk fed is determined by what will be cleaned up within a short time, for it is not allowed to stand in the fountains all day. Meanwhile the drinking fountains in the brooders are kept supplied with water and can be removed to the outside runways when so desired. At this period one or even two of the three daily feeds of the commercial chick feed may be replaced by the "johnny cake" described later. When the chicks are about 3 weeks old the commercial feed is gradually replaced by a mixture consisting one-half of whole wheat, one-fourth of cracked corn, and one-fourth of steel-cut oats. This is thrown in the litter in the inside runways, mornings and evenings, in quantity a little less than the chicks will eat. In the middle of the day 50 chicks receive in place of the grain mixture a piece of homemade bread, called "johnny cake," about 6 inches square and 2 inches thick. This is made of one part oatmeal, two parts corn meal, a little whole wheat flour, a pinch of salt, and infertile eggs from the incubators, the whole mixed with sour milk and soda. From 2 to 6 eggs are used in a johnny cake 18 inches square and 2 inches thick. The rule is to feed half to two-thirds of what the chicks will eat of this cake, and never to feed anything in such quantity that portions will be left to be trampled on after the chicks have lost interest in it.

In addition to the mixed grains and cake, a small quantity of some succulent material is thrown into the runways. For this purpose grass, apples, carrots, kale, lettuce, and the like are used. Kale is much relished, and lettuce is one of the best feeds of this kind. The quantity of this material fed may be judged from the statement that one apple or one leaf of kale is given to 50 small chicks.

Chickens will not scratch when they are overfed, nor when there is no feed in the litter. The idea is to keep them scratching.

The changes in rations are made gradually. Disorders are easily caused by sudden and radical changes of feed. During this period finely chopped meat or fresh beef scrap is fed sparingly. The chicks get a good many angle worms from the freshly spaded soil in the outside runs.

Scrupulous cleanliness is observed about the brooders and runways. Everything is carefully disinfected by the free use of disinfectants before the chicks are placed in their quarters. This prevents trouble with vermin and sickness. Any chicks that do not show growth and activity from day to day are immediately removed, thus insuring the strength and vigor of the flock.

MALES AND CULLS.

About the time the chicks are removed from the brooders, or as soon thereafter as practicable, all the young males not wanted as breeders and all females that are in any way defective are removed to the fattening pens. About one-tenth of the females are thus discarded. It does not pay to make a specialty of broilers, as there is no good local market for them; but large quantities of eggs are sold to those near the large cities who make a specialty of raising broilers.

These surplus birds are given quarters to themselves, consisting of pens with runways attached. Young chickens do not thrive if confined too closely. The more range they have the better. They are fed on a crumbly mash made of four parts of corn meal, two parts of middlings, and one part of beef scraps, and wet with warm skim milk fresh from the separator. If the milk is lacking, water may be used. As much of this feed is given twice a day as will be eaten up clean quickly. Any refuse food remaining an hour after feeding time is removed from the troughs.

Selling begins about a week after the culls are put in the pens, and the lot is disposed of as rapidly as the market will take them. They usually weigh 1 to 2 pounds by the time they are sold and bring 25 to 50 cents each.

The quarters in which these culls and surplus males are fattened are kept as scrupulously clean as any others. Free use is made of whitewash and air-slaked lime, while disinfectants are used on the perches to kill any mites that may chance to be present. A large dust bath is provided, and plenty of grit and fresh water are supplied.

Before the young birds have learned to roost on perches, clean straw is kept on the floor of the roosting room. The chicks sit on

this straw at night. To prevent crowding in the corners of the room, which is sure to occur unless provided against, the straw is piled high in the corners, so that it slopes downward toward the center of the room. When closing up the house at night to keep out enemies, a few chicks may be placed on the perches which should be low enough to be reached without difficulty. A cleated board slanting from the floor to the perch should be put up. In a short while the whole flock will take to the perches.

MANAGEMENT OF MALES SELECTED AS BREEDERS.

Both the young males and the young females retained in the flock are housed and taught to roost as just described for those in the fattening pens. They are fed differently, however, and are given much more range.

The young cockerels to be kept for breeding purposes are separated from the pullets as soon as they leave the brooder houses. The first incubation produces usually about 400 birds, 200 of which are males. Of these males 40 to 50 are retained as breeders. Before the breeding season begins about half of these have been disposed of—the poorest for meat and the others to farmers for breeding purposes—at from \$1 to \$2 each, according to quality. The plan is to keep for home use 15 cockerels where 10 are needed, so there may be a reserve on hand.

When the young cockerels are removed from the brooder house they are given a house out on free range. This house is placed in any convenient place on the farm, usually out in some field not occupied by a crop which the chickens will injure. It is moved about as convenience requires. A clover field is an especially desirable range. If the young birds are shut up in their house for a couple of days when first placed in it they will thereafter return to it to roost.

The feeding of these cockerels while on the range is similar to that of the pullets, described later. The cockerels remain on range until the breeding pens are made up in December.

CARE AND MANAGEMENT OF PULLETS.

When the young females are removed from the brooder houses they are divided into flocks of about 80 each and placed in small houses especially constructed for them. These houses are 5 by 10 feet, and may be moved about as desired. They are placed in any convenient subdivision of the farm, each pen of 80 being given an acre of range. On an exclusive poultry farm less space would be used, but space is abundant here and the young chickens, both male

and female, are given considerable range. They are taught to roost, and are prevented from huddling together in corners at night in the manner already described.

As in the case of the males, the females are kept shut in their pens for two days after the pens are located in the fields. After that they range near their pens and return to them at night, when they are carefully shut in to keep away enemies. Clover range is preferred for these young chickens, but the houses are located in a pasture, wood lot, or anywhere else where land is available. For a year or two a small plat of alfalfa on some high land near the house was used, and this proved to be excellent range. These pens are always kept away from the ranges occupied by laying hens.

The pullets and cockerels on range are fed all they will eat once a day, at night. The feed consists of mixed grains such as wheat, oats, barley, etc. Skim milk and water are given them freely. Much care is used to keep the milk vessels clean.

Some of the most precocious pullets, especially of the smaller breeds, begin laying at about five months of age. Some time before laying begins they are removed to the laying quarters, which have already been described (figs. 2 to 7). The older hens have meanwhile been sold or transferred to the breeding pens. After the pullets are removed to their new quarters they are fed as if they were laying hens.

In each laying pen 30 pullets are placed. These pens are 10 by 15 feet, with runs attached containing about 135 square feet to the hen. Careful watch is kept of these pullets, as those which begin laying early are almost invariably the best layers. Some of the best are later removed to the breeding pens. If any of the young females do not come up to the required standard they go to market. No males are allowed in these laying pens, except in special cases in which some of the eggs are to be used for hatching.

SELECTING LAYERS AND BREEDERS.

In making up the laying and breeding pens, the first consideration is stamina, if eggs are wanted. Stamina is not so important if the breeder merely desires fancy points. On this farm the requirements of fashionable breeders are not very closely adhered to. It is found impossible to do so and to maintain as high an average yield of eggs as when less attention is paid to fancy points. The owner, who has bred up a good herd of special-purpose dairy cows after having first failed with a general-purpose breed, says that breeding for fancy points and egg production together is like trying to breed general-purpose cows. It is vastly more difficult than to breed for egg produc-

tion alone. That he has succeeded in breeding for eggs is easily seen when a pen of 30 pullets in 1905 laid an average of 186 eggs during the season. Although not unmindful of breed requirements, an exceptional layer is not sacrificed because of some breed requirement that has no relation to egg production. Having 500 yearling hens and as many pullets from which to select less than 150 breeders, it is easy to secure good layers sufficiently near to breed standards to satisfy any reasonable requirement.

AGE OF HENS.

Pullets intended for the laying pens are hatched between February 15 and May 1. The larger breeds are hatched from February 15 to April 1; the smaller breeds from March 15 to May 1. Although the pullets do not usually molt, they sometimes partially do so in the fall. This interferes with laying, as hens do not lay well when molting. Since the yearling hens molt in September and October it is important that the layers should be pullets. Two-year-old hens molt a month later than yearlings.

No hens are kept beyond their first laying period, except those that are known to be excellent layers. A good pullet usually lays fairly well the next year. The breeding pens are made up mostly from those yearling hens that did best as pullets. If there is any shortage of these, the most promising of the new crop of pullets are selected. Only the most vigorous and most mature pullets are used as breeders. Occasionally a hen of exceptional merit is kept as a breeder the third year.

The Blanchards are much interested in the question whether pullets are born with a tendency to produce a small or a large number of ovules, and they believe it desirable that this problem should be studied by competent investigators. If pullets are all born with the inherited power of producing a large number of ovules, then proper care and management ought to give large yields of eggs. If they vary greatly in this inherited tendency, then no amount of care will make good layers of some hens. From theoretical considerations and the fact that different hens with the same care lay widely different numbers of eggs, the writer is inclined to the view that inheritance is highly important in the matter of egg laying. Otherwise, such increase in egg production as has been secured by using as breeders hens of known excellence as layers would not have occurred, unless, of course, this selection simply resulted in building up a flock of good layers adapted to the particular methods of management used.

An interesting fact which has developed in the experience on this farm is that greatly increased egg production in the two larger breeds (Barred and White Plymouth Rocks) is accompanied by a decrease

in the percentage of fertility in the eggs. At the same time the number of chicks that fail to hatch properly increases. This is not the case with the smaller breeds (Brown Leghorns and Black Minorcas). The White Wyandottes are intermediate in this respect.

Experience on this farm also shows that some hens lay no eggs; others lay 35 to 40; some lay 200; and occasionally one lays as many as 250 in a year.

The farmer whose hens average 50 eggs each can easily improve this average by breeding from his best, as has been done on this farm. Of the five breeds kept, all have been successfully bred for high egg production.

As is the case with breeders of all kinds of stock, improvement at first is easy. But as a flock or herd is built up to a high standard it becomes increasingly difficult to make further improvement. When a large number of breeders are working along the same lines, the problem is easier. Unfortunately, most poultry breeders who have produced flocks of high excellence have been breeding for fashionable points, frequently to the utter neglect of egg production. The owners of this farm have great difficulty in securing new breeding stock so as to avoid too much inbreeding. Their experience with stock bought from prize-winning flocks has often been very unsatisfactory. On one occasion four fancy cockerels were bought from a prize winner. Three of them proved to be worthless; one of them did not fertilize a single egg. On another occasion two cockerels and four pullets were secured from the flock that had won more prizes than any other on the Pacific coast. One of these cockerels was placed in a pen of excellent hens. In the next generation the egg production was wholly unsatisfactory.

The difficulty just mentioned is not so great in the case of Leghorns as it is with other breeds, especially with Plymouth Rocks. High egg production is more firmly established in the Leghorns, and even the breeder for fancy points may maintain a high standard of egg production in this breed if he selects with sufficient care.

On this farm fowls are never inbred more than one or two generations. When inbreeding is practiced at all, careful watch is kept and a change is made at the slightest indication of need of it. It is often necessary to inbreed because of the difficulty of getting satisfactory breeding stock from others. It has never been found satisfactory to use young males and young females of the same breeding. It is considered better to breed an old bird to his or her offspring.

There has been some trouble with white feathers in the Minorcas and Leghorns, especially when inbreeding is practiced. These feathers disappear before the first molt and do not reappear. Such fowls are never put into the breeding pens, but if otherwise satis-

factory they are used as layers of market eggs. This difficulty in the case of Leghorns is believed to have originated from some stock obtained several years ago from a distant State. There is some indication that this defect is a recessive Mendelian character which only crops out when both parents possess the defect, and then in only one-fourth of the progeny. It has no effect on egg production.

There has been some difficulty in keeping the combs of the Plymouth Rocks from getting too large. Some strains of this breed seem to run to large combs.

In breeding Plymouth Rocks for layers the weight has fallen below score-card standards. Little attention is paid to this point. The owner of this farm thinks the standard weight of this breed may be important for the broiler trade, but not for egg producers.

CARE AND MANAGEMENT OF LAYING HENS.

The pullets and hens are divided into two groups, the larger number, all pullets, having no males in their pens and are intended to supply eggs for market only. These are referred to here as the layers. The other group is known as the breeders and their pens are called the breeding pens. The breeders are chosen from among the best layers of the preceding year, together with some pens of promising pullets—that is, pullets of unusual vigor and early development, especially those that begin laying at an early age. Occasionally a hen of unusual excellence is kept in the breeding pens the third year.

By August all of the previous year's breeders except the occasional hen of unusual excellence have been disposed of; likewise all of the preceding year's layers except those reserved as breeders. About this time the layers kept over for breeding purposes are placed in the breeding pens and the pullets are brought in from their ranges and installed in the laying pens, the overflow going temporarily to what breeding pens may be empty.

No males are put into the laying pens unless it is desired to secure eggs for the incubator trade. The hens in these pens are good layers, but are not so carefully selected for breed characteristics as are those in the breeding pens. These eggs are excellent for broiler producers, as they produce vigorous chicks. When using laying pens for securing fertile eggs, two males are placed with each pen of 30 hens and the hens are handled as described for breeders.

Hens in laying pens with no males are not kept in their runs as strictly as breeders are. When the weather is suitable they are allowed free range, after having been confined long enough so that each hen will return to her own pen at night. Breeders during the

breeding season, which lasts from December until June, are kept strictly segregated and are not allowed out of their pens and runs.

A great deal more care is required to get hens to lay regularly out of the usual laying period, which is in late winter and early spring. By using pullets only in the laying pens the owners get a large supply of market eggs in the fall and early winter when older hens are molting and fresh eggs are scarce and high priced.

BROODY HENS.

The hens are carefully shut in at night to prevent loss from owls, weasels, etc. Every evening, when the hens are shut up, a search of the nests is made for hens beginning to sit. If any are found, unless they are needed for hatching some small lot of eggs or for starting a few eggs to refill incubators when the infertile eggs are tested out, they are put in a small separate pen maintained for this purpose. This pen has the usual runway attached, but there are no nests in it. It is highly important that broody hens, unless it is desired to have them sit, should not remain on the nest overnight. If taken in hand the first day they are easily broken from sitting. The remedy used for broodiness is to put the hens where there are no nests, and do this promptly. Late in the season hens are more persistent about sitting. Older hens begin laying later in winter and get broody later. Those that begin laying early get broody early, if at all.

If broody hens are properly fed they will soon begin to lay again; they are then returned to their proper pens. Plymouth Rocks are more inclined to broodiness than Leghorns and Minorcas. Late in the season, near the molting period, even Leghorns are inclined to become broody.

FEED OF LAYING AND BREEDING HENS.

The system of feeding laying hens is similar to that for breeders. The laying houses are shown in figures 2 to 7. The floors of these houses are usually covered 4 to 6 inches deep with straw in order that the hens may obtain the exercise they need by scratching in it for their grain. Part of the feed is given in the hoppers (self-feeders) shown in figure 5. The hoppers are divided into four compartments, two opening into each room. One compartment in each room is supplied with a mixture of one part ground bone and three parts of oyster shells, which are bought already broken. The owner thinks that ground fresh bone would be better than that he uses, but he can not conveniently secure the fresh bones for grinding.

The other compartment in each room is filled with a dry mash consisting of four parts of bran, two parts of oats, and one part each of

shorts and corn meal. Meat meal is added to this mash, the quantity depending on whether milk is available. Where skim milk is fed, one part of meat meal to twenty-five of the mash is added. When skim milk is not fed the meat meal is added at the rate of one part to ten of mash. The skim milk is fed separately, not in the mash. It has been found unwise to change a pen of laying hens from wet mash to dry; it is all right to feed dry mash to layers and breeders if it has been fed to them since they were chicks. Hens do not eat rolled barley well, but eat ground barley readily.

The dry mash is kept before the hens constantly, a week's supply being put in the hopper at a time. In addition to this, whole mixed grains, one-half wheat, one-fourth oats, and one-fourth corn (less corn in warm weather) are fed once a day, about 3 or 4 o'clock in the afternoon. This mixed grain is thrown into the litter on the floor of the pens, in quantities sufficient to give the hens all they will eat before going to roost—usually a little more than they will eat then, so that when they fly down in the morning there is still left in the straw enough feed to start them to scratching. When they are laying, hens eat more than at other times and should be fed accordingly.

Sharp gravel, for grit, is kept in a box in the outside runways. When skim milk is available, ground bone and meat scraps may be dispensed with; otherwise these nitrogenous materials are indispensable. In addition to the feeds mentioned, some kind of succulent feed is kept constantly before the hens. For this purpose cabbage, kale, mangel-wurzels, carrots, apples, green clover, etc., are utilized. Alfalfa or clover may be cut fine and fed in a box. Alfalfa meal, when available, may be added to the dry mash to advantage.

Another system of feeding is sometimes used with certain pens. It differs from the preceding as follows: The dry mash is omitted; mixed grains, two-thirds oats, one-third wheat, with a little corn in very cold weather, are fed in the litter in early morning; about 4 p. m. a wet mash, similar in composition to the dry mash previously described, is given, in quantity as much as will be eaten up clean before the hens cease feeding.

If the right kind of feed is used a hen that is laying regularly will hardly eat more than she needs. But hens that are not laying, or that are laying at infrequent intervals, can easily be overfed. The feeder must watch carefully and feed each pen of hens according to their condition and egg production. It is a good plan to put in the same pen those that lay about the same number of eggs; the feeding can then be better regulated to suit the needs of the hens.

CLEANING DAY.

The dropping boards (see figs. 6 and 7) are cleaned once a week. These boards are directly beneath the perches and are kept covered with a thin layer of dry dirt and frequently sprinkled with slaked lime. Beginning at one end of the building, a wheelbarrow is pushed through the swinging doors which separate the pens (the doors swing both ways) and is placed directly under the spout (fig. 6, c). A hoe is used in removing the droppings.

As previously stated, the litter on the floor is replaced about every ten days, and about twice during the winter the floors are thoroughly cleaned, free use being made of disinfectants if there is the least sign of its being needed. In summer, when the hens are not closely confined to their pens and runs, the litter is not always used, the dirt floors being left bare. In this case the floors are thoroughly cleaned once a month.

MANAGEMENT OF BREEDING HENS.

About one-fourth of the flock of hens is handled separately from the layers, for the production of fertile eggs. About 2,000 of these eggs are incubated on the farm, the remainder being used to supply a growing demand for eggs for hatching. During the summer, as the layers of the previous winter are disposed of, the best are retained for the breeding pens. By September the selection of the most promising pullets for breeders begins. This continues till about December 1, at which time the selected pullets are transferred to the breeding pens, if this has not already been done. The pullets are either transferred to the breeding pens as selected, or, if this is not convenient, they are marked by means of leg bands. The most important points to be looked for in pullets are stamina and early maturity. Those that begin laying early are invariably the best layers. An experienced poultryman can tell in advance when pullets are about to begin laying. At this time they rapidly assume their mature form.

During the breeding season, December to June 1, the breeding hens are confined strictly to their pens and attached runs. At other times they are handled just as the layers are handled. Males are allowed with the hens during the breeding seasons only. About the 1st of June, or when the demand for incubator eggs ceases, the males are removed, those not needed again being sold, the best of the yearlings being placed in separate houses on the range, away from the range of the hens. When the males are away, the hens are all allowed to range as freely as circumstances permit, but are carefully housed at

night. Hens soon learn to return to the proper pen at night. Two days confinement in their quarters is sufficient to teach them that.

It is not absolutely necessary to allow hens the freedom of a range; they may be kept in small runs. But they need less feed and require less care when they have good range.

The number of breeding pens of each breed is governed by the demand for fertile eggs. For the last few years four pens of Barred Plymouth Rocks, two each of White Plymouth Rocks, Brown Leghorns, and Black Minorcas, and one of White Wyandottes have been maintained. The demand for eggs of the different breeds varies from year to year, but the Barred Plymouth Rocks usually lead all the others. Eggs sold to breeders are taken only from the carefully selected hens in the breeding pens. If the demand for eggs from the producers of broilers exceeds the supply, males are put with the best pens of layers.

While in the laying pens 30 hens are kept in a pen, in the breeding pens only one-fourth to one-half this number are kept together. Of the largest breeds frequently only 8 are kept in one pen; of the smallest, 12 to 15. About 10 Minorcas constitute a breeding pen. The breeding pens are only about half as large as the laying pens. The runs attached to these pens are 30 by 100 feet, thus giving each hen 200 to 375 square feet of run. Runs of this size can be kept well sodded if given proper attention. Clover is very fine for these runs, and by sowing it in June, when the hens are not confined to the runs, a good growth can be obtained by the time they are confined in December.

SELECTING THE MALES.

Some of the breeding pens contain yearling hens, others pullets. Two-year-old males are preferred for both classes, but this necessitates carrying a large number of males until they are nearly 2 years old before they are used. The plan on this farm is to carry over enough of the cockerels used the preceding winter with the mature hens to have older males for all the pens of pullets, and as many more as convenient. The remainder of the pens of mature hens are supplied with young males hatched early the preceding season. Then these young males, or the best of them, are kept over for the pens of pullets the next season. In this way there is always age in one sex, at least, in each pen. It is thus possible to avoid using males and females from the same parents. It is found safer to breed older birds to their own offspring than to breed together those hatched the same season from the same lot of eggs.

The breeding pens are completely made up early in December and the males put in at once. One week later the testing for fertile

eggs begins. If broody hens are at hand one of them is set and the eggs tested the sixth or seventh day. If hens are not available a small incubator is used. Fifty per cent of fertile eggs at the first test is considered satisfactory. The percentage of fertility increases rapidly as the season advances. Plymouth Rock pens that give eggs 50 per cent fertile one week after the males are put in the pens will give 60 to 75 per cent of fertile eggs by January 15. Leghorns and Minorcas test 15 to 25 per cent higher both at the first and at later tests. Some fertile eggs may be obtained two or three days after the males are added. Fertility should reach a maximum in ten days.

If the first test shows low fertility, no eggs are sold for hatching until the difficulty is remedied. To do this, males are changed from pen to pen, or two males, each on alternate days, are placed in a pen. An extra supply of males is kept for this purpose, usually half as many more as there are pens. Careful watch of the pens will reveal whether the hens take kindly to a new male. If they do not a change is made. Strong likes and dislikes appear in chickens as in other bipeds. Two males are sometimes placed in the same pen at the same time, provided they do not fight.

POULTRY PRODUCTS MARKETING.

Three classes of eggs are sold. First, by far the larger proportion of the eggs go to the regular trade. About half of these were for some years contracted for by the year at 25 cents a dozen. At present all these eggs are sold at market prices, as this pays better at prices that have prevailed for the past few years.

The choicest eggs from the breeding pens are sold in sittings of 13. Although sold as 13 per sitting, 15 are frequently put in, on the theory that a satisfied customer is worth something by way of holding and extending trade. Nearly all of these eggs go to farmers; a few to fanciers who need this vigorous blood to remedy the defects arising from their system of breeding for feathers.

The remaining eggs from the breeding pens are sold in incubator clutches of 50 to 300 or more. The market for this class of eggs extends from late December to the last of May.

Three classes of chicks are sold: (1) Culls and discarded male chicks, which are fattened and sold as soon as the trade will take them, usually at 25 to 50 cents each. (2) Hens over a year old, except those wanted as breeders; some of these are sold to farmers as breeders, and the remainder go as meat. (3) After the first year a few young cocks are sold for breeding purposes.

INCOME FROM POULTRY.

For the year 1906 the income from poultry on this farm was as follows:

Income from sales of poultry and eggs for 1906.

Eggs:	
6,090 dozen to the trade, at 25 cents.....	\$1, 522
7,600 eggs for hatching, at 7 cents each.....	532
Poultry	300
Total	2, 354

WORK STOCK.

The work stock on this farm consists of a team of horses and a team of brood mares. One or two colts are raised yearly. In winter these are fed timothy hay and sheaf oats along with some carrots and ruta-bagas. In summer they are fed mostly soiling crops, clover and peas and oats being used. At night they are turned out into a small pasture. When a team is doing heavy work, in addition to the above feeds each animal receives about 8 quarts a day of some kind of grain.

CONCLUDING REMARKS.

Unfortunately the writer is unable to give the expenses of this farm. Estimates could be given, but they would be of little more value than knowledge already in the possession of every intelligent farmer. The Office of Farm Management is now conducting extensive and careful investigations concerning the cost of everything on a large number of farms. When these investigations are completed, something more than estimates of cost can be given for such farms as the one here described.

Leaving aside the question of profits, here is a farm that is well-nigh ideal. The farm home is all that could be wished, except that school facilities, 12 miles in the country, in the foothills of the Olympics, have not been all that could be desired. The library is well supplied with agricultural journals, to nearly all of which the farmer and his estimable wife are valued contributors. For many years the owner of this farm was president of the State Dairymen's Association, and he is a prominent farmers' institute worker in more than one State. One son is employed as a scientist by the United States Department of Agriculture; another will be a farmer; the third has not yet selected a vocation, but likes farming. One daughter is teaching; one looks after the poultry; the third keeps the books. All of them are well grounded in domestic economy.

Here is a farmer who has not lived in vain. He has done his duty to his country, and it is fitting that the results of his labors should thus become the common property of his fellow-farmers.